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EXAMINER

ALANKO, ANITA KAREN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 07/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/069,208

Applicant(s)

KOBAYASHI ET AL.

Examiner

Anita K Alanko

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/10/02 pre-amdt "a".
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 6-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 6-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 6/10/02 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: _____

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 6-9 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by JP 2000-036484.

JP 2000-036484 discloses part-way etching through an organic layer (Fig. 13b) with nitrogen, hydrogen and argon (abstract).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robb (US 4,529,860).

Robb discloses a method of etching an organic film (polyimide) on a workpiece (silicon substrate) (Example V, which incorporates Example I, col.6, lines 27-61 and col.4, lines 7+, respectively), the organic film having an etching mask (hard mask layer of silicon nitride or silicon oxide), the method comprising:

placing the workpiece in a hermetically sealed process chamber 38;

introducing processing gas comprising a gas comprising nitrogen atoms and a gas comprising hydrogen atoms into the process chamber ("mixed hydrogen-nitrogen plasma" or Example V); and

etching the organic film (the anisotropic etch of Example V).

Robb does not explicitly recite that the etch is stopped before the etching goes through the organic film. However, Robb does teach that the etch can be conducted to a "predetermined amount" (col.2, lines 52-54). Examiner takes official notice that it is a known technique to form various profiles in substrates by sequentially etching with different parameters and compositions which encompasses stopping the etch before breakthrough. Alternatively, it is well known that etching processes are optimized by first etching part-way through a layer with a fast etch and then second etching to breakthrough with a more controlled etch. It would have been obvious to one with ordinary skill in the art to stop the etch before the etching goes through the film in the method of Robb because a predetermined amount can include part-way etching through to optimize the etch for best results in the final product.

As to claims 7-9, 11, 13-15, Robb discloses that the etch gas comprises nitrogen, hydrogen and argon (Example V and VI). It would have been obvious to one with ordinary skill

in the art to add argon in the method of Robb because it is a conventional diluent for etch compositions as taught by Robb.

As to claim 10, Robb discloses to etch at 150 mTorr (20 Pa, Example V), and also teaches that a range of up to 500mTorr (66.5 Pa, col. 1, lines 26-28) is known. Robb also teaches that high pressure etching of polyimide is also known (col. 1, lines 21-22), which presumably encompasses pressures greater than 500 mTorr, however at higher pressures later etching becomes more pronounced. Robb therefore teaches that the pressure is a result effective variable. It would have been obvious to one with ordinary skill in the art to etch at 500 mTorr or higher in the method of Robb because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claim 12, it would have been obvious to one with ordinary skill in the art to etch at 500-800 mTorr in the method of Robb because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB

Claims 6-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robb (US 4,529,860) in view of admitted prior art.

Robb discloses a method of etching an organic film (polyimide) on a workpiece (silicon substrate) (Example V, which incorporates Example I, col.6, lines 27-61 and col.4, lines 7+, respectively), the organic film having an etching mask (hard mask layer of silicon nitride or silicon oxide), the method comprising:

placing the workpiece in a hermetically sealed process chamber 38;

introducing processing gas comprising a gas comprising nitrogen atoms and a gas comprising hydrogen atoms into the process chamber ("mixed hydrogen-nitrogen plasma" or Example V); and

etching the organic film (the anisotropic etch of Example V).

Robb does not explicitly recite that the etch is stopped before the etching goes through the organic film. However, Robb does teach that the etch can be conducted to a "predetermined amount" (col.2, lines 52-54). Admitted prior art teaches that it is useful to stop the etch before the etch goes through the film (page 1, lines 25-28). It would have been obvious to one with ordinary skill in the art to stop the etch before the etching goes through the film in the method of Robb because Robb teaches to etch a predetermined amount and admitted prior art teaches it is useful to etch part-way through the layer.

As to claims 7-9, 11, 13-15, Robb discloses that the etch gas comprises nitrogen, hydrogen and argon (Example V and VI). It would have been obvious to one with ordinary skill in the art to add argon in the modified method of Robb because it is a conventional diluent for etch compositions as taught by Robb.

As to claim 10, Robb discloses to etch at 150 mTorr (20 Pa, Example V), and also teaches that a range of up to 500mTorr (66.5 Pa, col.1, lines 26-28) is known. Robb also teaches that high pressure etching of polyimide is also known (col.1, lines 21-22), which presumably encompasses pressures greater than 500 mTorr, however at higher pressures later etching becomes more pronounced. Robb therefore teaches that the pressure is a result effective variable. It would have been obvious to one with ordinary skill in the art to etch at 500 mTorr or

higher in the modified method of Robb because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claim 12, it would have been obvious to one with ordinary skill in the art to etch at 500-800 mTorr in the modified method of Robb because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K Alanko whose telephone number is 703-305-7708. The examiner can normally be reached on Monday-Wednesday and Friday, 8:00 am-4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Anita K Alanko
Primary Examiner
Art Unit 1765

AKA
June 30, 2003